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EXAMINER	
BAREFORD, KATHERINE A	

ART UNIT	PAPER NUMBER
1792	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/803,949	WANG ET AL.	
	Examiner	Art Unit	
	Katherine A. Bareford	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 April 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,6-8,10,12-19 and 32-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,6-8,10,12-19 and 32-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 3, 2008 has been entered.

The amendment filed April 3, 2008 with the RCE submission has been received and entered. With the entry of the amendment, claims 2-5, 9, 11 and 20-31 are canceled, and claims 1, 6-8, 10, 12-19 and 32-34 are pending for examination.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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3. Claims 1, 12-19 and 32-34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to

reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In the amendment of April 3, 2008, independent claim 1 has been amended to require performing the preplating treatment "while sealing and outer peripheral portion of the dry substrate" and then rinsing and electroless plating "while exposing the outer peripheral portion of the substrate." However, this process is only supported in the originally filed disclosure, see pages 31-34 and Figures 10A-10C, when the pretreatment material is ejected, as in claim 6 and not when immersed (as in previous claim 9). While claim 9 has been canceled, claim 1 is still of a scope to include the immersion option as in previous claim 9, and therefore the scope of claim 1 is beyond what is supported in the originally filed disclosure, and contains new matter.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were

made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1, 6-8, 12-13, 17, 19 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrier et al (US 5843517) in view of Chen et al (US 6699380), Japan 11-317161 (hereinafter '161) and EITHER WO 03/056614 (hereinafter '614) OR Japan 2001-316879 (hereinafter '879).

Ferrier teaches a substrate processing method. Column 3, lines 15-35. A substrate is provided having both a metal region and an insulating film on a surface thereof. Column 2, lines 55-65 and column 4, lines 40-55. Ferrier provides a preplating treatment to the surface of the substrate, where pretreatment liquid (activator solution) is brought into contact with the surface of the substrate. Column 3, lines 15-25. This liquid etches the surface from the acid in the liquid (thereby removing a metal oxide film form the surface of the metal region and residue from a surface of the insulating film, which will inherently occur given the "etching" and the amount of acid in the solution). Column 3, line 65 through column 4, line 10 and column 4, lines 30-40. At the same time, the liquid also contains catalyst ions that impart a catalyst to the metal region so as to activate the surface of the metal region. Column 3, lines 35-50 and column 4, lines 30-40. Then, pretreatment liquid remaining on the surface is removed in

a rinsing treatment. Column 4, lines 20-25. Then an electroless plating process is performed on the surface of the substrate to selectively plate and alloy film on the surface of the metal region. Column 4, lines 20-30, column 3, lines 1-10, and column 5, lines 25-50. While Ferrier teaches adding an "oxidizing agent" to his pretreatment solution of aqueous acidic solution (column 3,lines 15-25), Ferrier also teaches "comparative" examples where the pretreatment liquid does not contain the "oxidizing agent" and rather can contain, for example aqueous acidic liquid containing palladium chloride (comparative example 1 or example 5 comparatives, for example) and notes the use of sulfates (column 2, lines 38-41) and further can contain acids in the form of hydrochloric acid (comparative example 1, 2) or sulfuric acid (comparative example 1, example 5 comparatives). Ferrier notes that electroless plating occurs from the comparative examples, and in some cases without overplate. See comparative examples 1 and 2 and example 5. The comparative examples teach useful and usable plating processes, because as discussed in MPEP 2123, "The use of patents as references is not limited to what the patentees describe as their own inventions or to the problems with which they are concerned. They are part of the literature of the art, relevant for all they contain." In re Heck, 699 F.2d 1331, 1332-33, 216 USPQ 1038, 1039 (Fed. Cir. 1983) (quoting In re Lemelson, 397 F.2d 1006, 1009, 158 USPQ 275, 277 (CCPA 1968)). Furthermore, MPEP 2123 goes on to state that ""A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." In re Gurley, 27 F.3d 551, 554, 31 USPQ2d 1130,

1132 (Fed. Cir. 1994)." These pretreatment materials are provided in a manner so as to form a continuous pretreatment film on the surface of the substrate during the pre-plating treatment, thus preventing the activated surface of the metal region from being re-oxidized since it is not exposed to an oxidizing environment. See comparative examples 1 and 2 and example 5 (the substrate is immersed in the pretreatment solutions for a set period of time).

Claim 6: the pretreatment solution can be applied by spraying. Column 4, lines 30-40.

Claim 12: the rinsing includes rinsing with water. Column 5, lines 20-25.

Claim 17: a desired temperature of the solution is between 20-40 degrees C. Column 4, lines 30-40. A desired concentration of components is also given. Column 3, line 35 through column 4, line 10.

Claims 32: the comparative pretreatment liquid can include sulfuric acid. See comparative example 1 and example 5 comparatives. Palladium is provided in the pretreatment liquids from salts such as palladium chloride. See comparative example 1 and example 5 comparatives. Ferrier also provides the use of sulfates and chlorides to provide the salts. Column 3, lines 38-41.

Claim 33: the preplating treatment simultaneously performs the metal oxide film removal (as shown by the etching), residue removal (as shown by the etching) and imparting the catalyst (activation). Column 4, lines 30-40.

Claim 34: the electroless plating is performed after removing the pretreatment liquid. Column 4, lines 20-30.

Ferrier does not teach that (1) the initial substrate is dry (claim 1), (2) that after electroless plating the substrate is post-cleaned and dried (claim 1), (3) spraying solution on a downwards facing substrate and rotating the substrate (claims 6,7), (4) the different flow paths (claim 8), (5) the pure water used (claim 12), (6) the cleaning using aqueous liquid mixed with one component or more of an electroless plating solution (claim 13), (7) maintaining conditions of the pretreatment conditions and electroless plating conditions (claims 17, 19), (8) that the pretreatment liquid without oxidizing agent specifically removes metal oxides, and (9) the sealing of an outer peripheral portion of the substrate during pretreatment, but not during rinsing or electroless plating (claim 1). As to a dry substrate, Ferrier does teach that the process can begin with contacting with the pretreatment activator solution, as the steps 1 and 2 are optional (column 4, lines 15-30).

Chen teaches a substrate processing method that can be used to treat integrated circuits with metal regions. Column 1, lines 15-20. The process includes providing a dry substrate to a processing module. Column 8,lines 5-20. Then, preprocessing occurs. Column 8, lines 10-20. Then, plating, which can be electroless plating, occurs. Column 8, lines 15-25 and column 1, lines 25-30. Finally, post processing, including rinsing, cleaning, and drying occurs. Column 8, lines 20-30. Rinsing in the various steps can be done with pure water. Column 5, line 1 and 39. Liquid can be dispensed to the

substrate from a nozzle and the substrate can be facing downwardly. Column 5, lines 1-20. The substrate can be rotated during the treatment steps. Column 5, lines 1-20.

'161 teaches that it is well known that an acid solution of palladium chloride can be used to both etch and catalyze a surface prior to electroless plating. See the abstract. This surface to be etched is of metal oxide. See the abstract.

'614 teaches that when providing pretreatment for an electroless process, the substrate can be held facing downwards while sealing an outer peripheral portion of the substrate and treatment solution is sprayed upward onto the surface of the substrate from a nozzle system. Figure 2 and pages 10-15.

'879 teaches that when providing treatment (washing) liquid to a substrate wafer, the wafer can be held facing downwards in a holder that seals an outer peripheral portion of the wafer, and treatment liquid is sprayed upwards onto the surface of the substrate from a nozzle system. See figure 1, abstract and paragraphs [0022], [0024] (see supporter 18 and how the wafer is pressed against it, including the parts over the peripheral edge of the wafer, during treatment).

Referring to claim 13, the Examiner has taken official notice that it is well known in the art of electroless plating to rinse the substrate with a surface active agent, reducing agent, chelating agent, complexing agent, or other component of the electroless plating bath prior to plating the substrate. As applicant has not traversed this statement from the June 9, 2006 Office Action, it is understood to be agreed to prior art.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ferrier to (1) (2) provide that the initial substrate is dry and that after plating the substrate is post-cleaned and dried as suggested by Chen with an expectation of providing a desirable electroless plating process, because Ferrier teaches a pretreatment and electroless plating process for a substrate and Chen teaches that when providing a pretreatment and electroless plating process, it is well known to start with a dry substrate and to post-clean and dry the substrate after plating. It would further have been obvious to (3) modify Ferrier to provide spraying solution and rinsing liquid on a downwards facing substrate and rotating the substrate as suggested by Chen with an expectation of providing a desirable electroless plating process, because Ferrier provides that the pretreatment liquid in the plating process can be applied by spraying and Chen teaches that it is well known in electroless plating to provide the liquids to a downwards facing substrate and rotating the substrate during treatments. (4) As to the different flow paths of claim 8, while the flow path system of the rinsing and the pretreatment fluid are not disclosed it would have been obvious to one of ordinary skill that the fluid leading into the nozzle from the pretreatment liquid source must flow from a different source than the rinsing fluid as the two fluids are different and must have different sources therefore the flow paths cannot be identical even if some of the same flow paths is used. (5) It would further have been obvious to modify Ferrier to provide pure water rinsing liquid as suggested by Chen with an expectation of providing a desirable electroless plating process, because Ferrier

provides rinsing with water and Chen teaches that it is well known in electroless plating processes to provide pure rinsing water. (6) As to the cleaning using aqueous liquid mixed with one or more components of an electroless plating solution, it would have been obvious to modify Ferrier in view of Chen to provide such a cleaning liquid with an expectation of providing a desirable electroless plating process, because it is well known in the art of electroless plating to be desirable to rinse the substrate with a surface active agent, reducing agent, chelating agent, complexing agent, or other component of the electroless plating bath prior to plating the substrate. (7) As to maintaining the conditions of the pretreatment conditions and the electroless plating conditions, Ferrier teaches desirable pretreatment liquid conditions, and it would have been obvious to one of ordinary skill in the art to maintain the conditions within the desired ranges in order to achieve the desired benefits of those ranges. As to the electroless plating conditions, it would be obvious to one of ordinary skill to keep the temperature, composition and component concentrations in predetermined ranges during the plating process so that the plating proceeds at a uniform rate. It would be obvious to one of ordinary skill to stop the plating process when the thickness of the plated layer reaches its desired thickness so that the plating does not progress pass the desired thickness. (8) It further would have been obvious that the pretreatment solution of Ferrier in view of Chen without the added oxidizing agent can desirably etch a metal oxide film on the metal surface as suggested by '161 as part of the process of providing a desirable electroless plating film, because Ferrier in view of Chen teach that a

pretreatment liquid of palladium chloride or other salts can be provided in a aqueous acid solution with hydrochloric or sulfuric acid without further oxidizing agent added as a pretreatment liquid before electroless plating and Ferrier also teaches the desire to activate and etch with pretreatment liquid, and '161 teaches that it is well known that palladium chloride in a acid solution can conventionally be used to etch and activate metal oxide surfaces, and thus the application of the palladium/acid solution without oxidizing agent of Ferrier can be desirably used for etching and activating. (9) It further would have been obvious to modify Ferrier in view of Chen and '161 to provide that the peripheral edge of the substrate is sealed during spray application of pretreatment liquid as suggested by EITHER '614 OR '879 in order to provide a desirable spray application of the pretreatment liquid, because Ferrier in view of Chen and '161 teaches the desire to apply pretreatment liquid to a downwards facing wafer from a spray system and BOTH '614 AND '879 shows the desirable use of a holder for the substrate in a plating system when applying liquid to a downwards facing substrate from a nozzle system, where the holder provides sealing of the outer peripheral portion of the substrate. It further would have been obvious for the rinsing and plating to be done while exposing the outer peripheral portion of the substrate, because Chen, for example, shows that it is well known to perform these steps in the exposed fashion (see column 4, lines 25-40 and figures 3 and 4).

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrier in view of Chen, '161 and EITHER '614 OR '879 as applied to claims 1, 6-8, 12-13, 17, 19 and 32-34 above, and further in view of Stevens et al (US Patent No. 6824612).

Ferrier in view of Chen, '161 and EITHER '614 OR '879 discloses all of the features of this claim except that the speed that the substrate is rotated at different times during the processing.

However, Stevens discloses that during the activation of a substrate for electroless plating it is desirable to rotate the substrate at relatively low speeds to facilitate even spreading of the activation solution, and after the application of the activating solution the substrate can be rotated at higher speeds in order to remove any excess activating solution (column 6 lines 30-45).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ferrier in view of Chen, '161 and EITHER '614 OR '879 to use the rotational speeds suggested by Stevens with an expectation that the benefits discussed above will be achieved.

8. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrier in view of Chen, '161 and EITHER '614 OR '879 as applied to claims 1, 6-8, 12-13, 17, 19 and 32-34 above, and further in view of Yoshio et al (US Patent No. 6555158).

Ferrier in view of Chen, '161 and EITHER '614 OR '879 discloses all of the features of these claims except that the pretreatment and plating are performed in an

atmosphere having less oxygen than the atmosphere (claims 14, 15) and that a film thickness/property is measured after post-cleaning and drying.

However, Yoshio teaches an electroless plating process that includes pretreatment steps. Column 2, lines 30-45. Yoshio teaches that it is desirable to perform the pretreatment, rinsing and plating while rotating and discharging air pressure, thus lowering the pressure below atmospheric, reducing the amount of oxygen to levels below atmospheric. Figure 10 and column 7, lines 9-48. Yoshio also discloses performing a CMP (chemical mechanical polishing) procedure after the electroless plating, and that this can be done with ease. Column 8, lines 50-55. The only way to know the success of the CMP procedure is to measure the resulting film thickness after the CMP procedure.

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ferrier in view of Chen, '161 and EITHER '614 OR '879 to discharge air pressure during the process steps as suggested by Yoshio in order to provide desirable treatment because Ferrier in view of Chen, '161 and EITHER '614 OR '879 provides for treatment while rotating and Yoshio teaches that it is desirable to discharge air pressure while rotating during treatment, thus lowering the pressure below atmospheric, reducing the amount of oxygen to levels below atmospheric. It would further have been obvious to modify Ferrier in view of Chen, '161 and EITHER '614 OR '879 to measure film thickness after plating, post cleaning and drying as suggested by Yoshio in order to provide desirable treatment, because Ferrier

in view of Chen, '161 and EITHER '614 OR '879 provides plating, post cleaning and drying, and Yoshio suggests to further perform CMP procedures on the plated substrate, which would provide measuring the resulting film thickness after the procedure to confirm that the proper thickness and uniformity has been reached.

9. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ferrier in view of Chen, '161 and EITHER '614 OR '879 as applied to claims 1, 6-8, 12-13, 17, 19 and 32-34 above, and further in view of Arcilesi et al (US Patent No. 4814205).

Ferrier in view of Chen, '161 and EITHER '614 OR '879 teaches all of the features of the claim except measuring the concentration of an impurity and removing the impurity when it reaches a certain level.

Arcilesi teaches that when using an activator solution it deteriorates over time as the palladium ions precipitate out of the solution (form an impurity). Arcilesi teaches that when this happens the activator can be rejuvenated by addition of a ferric ion which redissolves the palladium (removes the impurity)(column 5 lines 15-30).

Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ferrier in view of Chen, '161 and EITHER '614 OR '879 to monitor the concentration of the palladium ions and to add ferric ions to rejuvenate the solution when the amount of Pd ions got low so as to extend the useful life of the activator solution as suggested by Arcilesi.

10. The Examiner further notes that McConnell et al (US 6165912) teaches electroless pretreatment to activate and remove oxide and electroless plating. The Examiner further notes Ting et al (US 5169680) and Kaja et al (US 5380560) both teach activation pretreatment liquids to be used to prepare a substrate with a metal/insulating region for selective electroless plating.

Response to Arguments

11. Applicant's arguments with respect to claims 1, 6-8, 10, 21-19 and 32-34 have been considered but are moot in view of the new ground(s) of rejection.

The Examiner has provided the new references to WO 03/056614 and Japan 2001-316879 as to the sealing of an outer peripheral portion of the substrate during the pretreatment operation.

The Examiner notes that 35 USC 102(e) date for WO 03/056614 extends back to December 26, 2002 as the international application was filed in English and designates the US, and has an international filing date after November 29, 2000. The Examiner also notes that WO 03/056614 is available as a 35 USC 102(a) document, as applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:00-3:30) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Katherine A. Bareford/
Primary Examiner, Art Unit 1792